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PROPOSED MODEL FOR MOBILE MARKETING SYSTEM WITH PUSH NOTIFICATION

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ABSTRACT: *These days, the quantity of information on the Internet is increasing day after day. With this amount of information becomes difficult to be monitored by users, since searching for specific information and follow this search may cost a lot of time and effort. Likewise, the use of smart phone is also increasing and make the information delivered through push notification to the users extremely easier. For this reason, This study introduces a new mobile marketplace application which provides follow search service to cater for these difficulties. The paper described the way to gather the requirements, develop Iraq Marketplace (IQM) mobile application and provide follow search service by sending push notification to users. Finally, it tests the usability of the application. The paper found that the prototype has a positive result in both system satisfaction and usability with how easy using the system.*

KEYWORDS: Push Notification, Mobile Application, Smart Phone, Mobile Technology

INTRODUCTION

In this modern world of ours, mobile phones have become part and parcel of our daily life style, with estimated mobile users of over 5 billion globally (Meeker, 2015). Most mobile phones support one or more of 4G, 3G, GSM, and WiFi for data transfer. For instance, 98% of countries have active 3G mobile networks, which cover almost 50% of the global population (Kende, 2015). This indicates that the total number of mobile users has been on the increase, consequently, the magnitude of information received by mobile users from the modern super highway (the internet), has become disturbing and alarming (Sallam & Udgata, 2011). Thus, information becomes very difficult to manage and searching for specific information relevant to ones' preferences cost a lot of time (Sallam & Udgata, 2011). To improve on these challenges, it is proposed in this paper that using Mobile Push Notification System (MPNS) in the mobile marketplace in Iraq can help in this regard by filtering information of interest to the mobile user when the information correlates with the mobile user's specifications. This means that huge information from the internet to the mobile user will now be controlled using MPNS. Consequently, search for relevant information using mobile phones will become much easier and a lot of time being saved.

Therefore, mobile technology services in Iraq need to incorporate MPNS with computer network services. The integration between information services (e.g. Databases), notification services (e.g. E-mail, alarm systems) and telecommunications infrastructure (e.g. GSM, Fax, etc.) is one of the strategic issues to satisfy mobility needs (Sallam & Udgata, 2011).

It is proposed that the introduction of MPNS in Iraq for the first time will bring multiplier benefits to mobile phone users, mobile service providers, and telecommunication operators, producers or sellers of different products and services. From the mobile users' point of view, users can access on demand, at any point in time relevant information from the MPNS. Alt-

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hough, MPNS provides a technology that increases users' access to relevant information, on the other hand, it increases management efficiency for service providers. Also, the more the MPNS services are used by phone users through their mobile phones, the more revenue can be realized by service providers. In addition, the telecommunication operators can benefit from revenue realized via fees charged to service providers for each MPNS transaction. Nevertheless, there are still quite a lot of challenges that have to be met and resolve for different stakeholders in order to have efficient MPNS. The main functions of MPSN include: matching indirectly buyers and sellers, facilitating the exchange of information, goods, services, and payments. Therefore, the proposed system collect and distribute information distributed among mobile users, service providers, telecommunication operators and producers. As a result, it would help mobile users in gathering preferential information and enabling mobile users to make their decision in time.

Based on the researcher's knowledge, there is no such a system in Iraq. Since Iraq is still one of the very few countries in the world that still so far from the real use of services of e-commerce (Al-taie & Kadhim, 2013). This objective of this paper is:

I. To develop a requirement model for mobile marketing system.

II. To develop a prototype of the system.

III. To validate the usability of the system.

Several concerns arise within the limitations and delimitations of the following research. For this investigation, the study has chosen to limit the research to an analysis and design marketplace application to Iraqi's consumers only. The study focused on Iraqi's students in UUM (Universiti Utara Malaysia) campus. The study also focus lays solely on smartphones, irrelevant of their type or brand, and therefore excludes other portable Internet connected devices such as tablets. The particular concern of any smartphone operating system, that a customer may use, is to access marketplace.

LITERATURE REVIEW

E-marketplaces are defined as: "[the] logical extension of the ability of large e-business companies or to place the procurement process online, and of all e-commerce companies to place their goods and services online, including payment and logistics". The main function of the marketplace is to facilitate transactions, match buyers and sellers, and provide an institutional infrastructure (Mironenko, 2011).

No doubt that the wireless and Internet provide an immediate Data and information around the world without considering time and location. The search engine is extremely helpful unit in mobile marketplace. It provides the needed of data and information to many units of mobile marketplace as regards to their request (Udgata & Sallam, 2011). Moreover, the search applications of mobile markets help universal system of communication suit information-based products (e.g. software, booking services, financial services, news) likewise for other retailing of several non-digital products like CDs, books, travel, flowers, PCs, groceries, and others. Typically, mobiles Marketplace provides electronic catalogs of Internet which support lists of services or products, commercial price and transaction information. Based on that, a list of services or products will be returned to device which meet the requirements

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specified by the user. Depending to the enormous number of agencies, i.e., buyer, supplier, payment, delivery, auction, broker, etc., and overloaded information presented and interacted between them, a search engine is considered as important unit and the backbone of the mobile marketplace (Udgata & Sallam, 2011).

The architecture of the notification service responsible for advertising and publishing services and products offered by the existing brokerage firm and supply channels to communicate with other mobile marketplace components that help to obtain useful data and information about sites and maps, that can assist to point the specific position of the service and product in the market, and gives information about location and city roads. Additionally, user or merchant according to the profile probably is useful to supply data or information product specification, merchant offers about, user requirement. This kind of service has impacted factor in reducing the cost, enhance the revenue and increasing the financial capability of mobile commerce.

Moreover, there are two benefits of the advertisement. First one personalized advertising efficiently and effectively offers targeted advertising to users which are probable to buy services and products; this which significantly improves businesses and sales make more profit. The second benefit is several personalized advertising service becomes not as an intervention extra but rather as a useful service to customers (Bozdag, E., Mesbah, A., & Van Deursen, 2007).

Mobile notification services designed for particular services have limited number of models (Church & de Oliveira, 2013). Extensibility is not supported by most of these models. A previous research has shown criteria that should satisfy the adaptive mobile notification (Efee, Niversity, & Echnology, 2010) as:

- Take the mobility of users into account: manage highly model of users' interests (deletion, insertion, update, subscription).
- Manage changes in the underlying network topology that may occur in very dynamic setting.
- Support multiple notification channels and multiple content formats: support heterogeneous notification channel (WAP, phone, fax, internet protocols, e-mail, etc).
- Support huge numbers of publishers and subscribers: continuously collect and integrate data distributed among a huge set of users.
- Propagate notifications for a large number of information consumer simultaneously, that managing huge amount of information sent to the system.
- Select the appropriate mode of communication: should deliver and filter relevant data to interested users and components in a timely manner with helps of middleware which gives filtered formation for a potentially huge set of users, gives their continuously changing location, their changing profiles.
- Support security and privacy of information: perform security functions, like secure content distribution, publisher and subscriber authentication.

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Models of mobile notification are intended to have low user perceived latency and high user interactivity. Usually, real-time dynamic website data need to be published any an update to the users as soon as possible. Nevertheless, these applications still have the limitations of the Web request/response architecture that prevents servers from pushing dynamic web data in real-time(Bozdag, E., Mesbah, A., & Van Deursen, 2007).

Table 1. Data delivery mechanism characteristics (Sun, 2014).

Pull		Request data when it is required, when a request is received at the server, the server locates the information of interest and sends it into the client.
Push		Data delivery involves sending information into a client population in advance of any specific request.
Periodic		Is performed according to some prearranged schedule, this schedule may be fixed or may be generated with some degree of randomness.
Aperiodic		Is event driven while a data request for pull according to any user action, or transmission for push regarding to data update by the server.
Unicast		Data items are sent from a data source (e.g., single server) to another machine.
1-N	Multicast	Data sent to a specific subset of clients (recipients is known).
	Broadcast	Send information over a medium on unidentified

In mobile marketplace notification system, the Mobile dealer server has the following characteristics. There are a large number of users who plan to access the information. The most users that follow the event closely, they are only interested in new information and updating of the existing information. Thus, the server received a request from each user, the huge audience for a common event may generate massive load on servers, this lead to significant delays and server crashes. According to this property, it becomes obvious that the request unicast process of data and information delivery may cause unwanted results. Moreover, the mobile devices still suffering from the constraint in display and keyboard and the capacity of processing. Thus, the mobile notification system requires using a suitable mechanism of data delivery to enhance the performance of mobile (Udgata & Sallam, 2011).

Proposed Method

The research methodology used in this study was general Research Design Methodology (Vaishavi & Jr., 2015) that containing five phases as shown in Figure 1.

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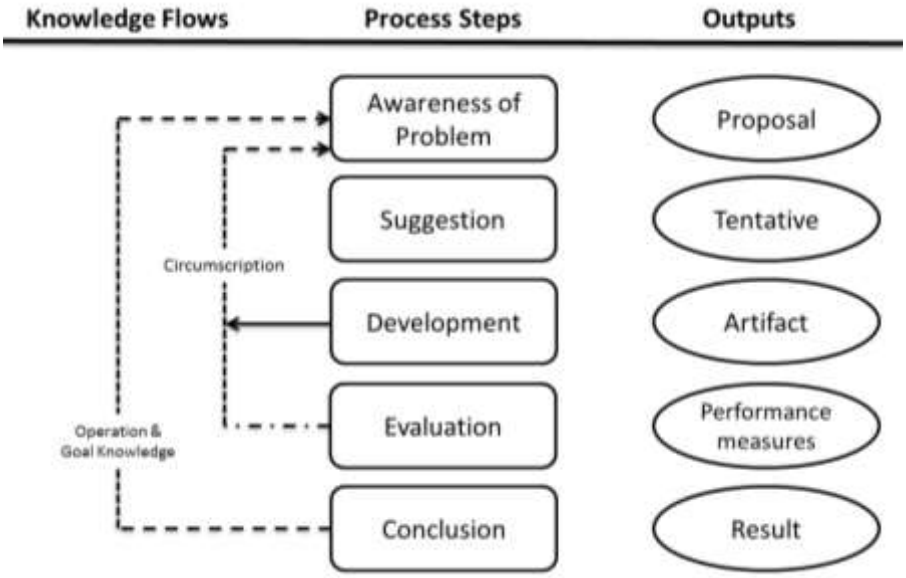

Figure 1 design research steps (Vaishavi & Jr., 2015)

Awareness of Problem

This is first stage involved to gather functional requirement and non-functional requirement. An interview approach used to collect information from users that will use the application. The study reviewed ebay, amazon e-marketplace mobile applications to understand the mechanics work for previous e-marketplace application where they are from ten top e-marketplace in the world (Meeker, 2015). The interview also conducted with three Iraqi users to understand what is the other properties for Iraq market requirements.

Suggestion

In order to develop a strong-design system, one of the major influences in the character of the systems developed is the software development approach taken. A methodology consists of an approach to software development (e.g. Object orientation), a set of notation and techniques (e.g. the Unified Modeling Language- UML, Entity Relationship Diagram ERD) that support the approach to structure the development process and unifying set of procedures.

The study used to develop a strong-design system. The output of this phase is the Tentative Design. The design of the system includes UML diagrams; The UML diagrams involved are used as case diagrams, sequence diagrams, class digram and Entity Relationship Diagram (include Conceptual ERD, Logical ERD, and Physical ERD).

Development

The study used an iterative-waterfall model to implement the suggested prototype model. Next, the design specifications are proposed and implemented to fulfill these requirements. As a result, a functional prototype is developed which is an extension of the prototype developed in the previous phase. The system interfaces of the mobile application have been pro-

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gramming using Angular.js framework and Ionic framework. Besides PHP Laravel framework on server side.

Further, in order to send a push notification to a mobile device, the study used Google Cloud Messaging. As per google's documentation "Google Cloud Messaging for Android (GCM) is a service that helps developers to send data from servers to their Android applications on Android devices", Figure 2 illustrates how a push notification is sent (Tamada, 2012).

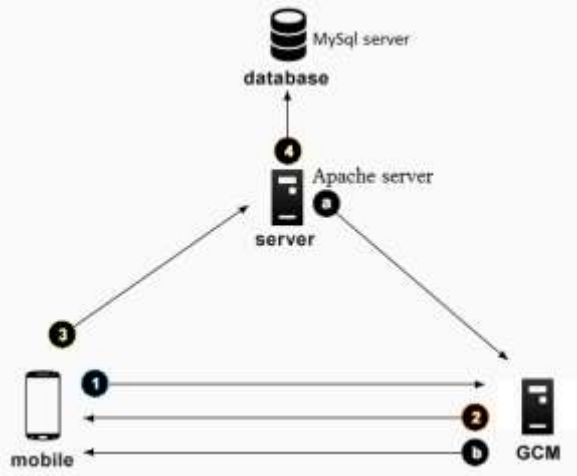

Figure 2 illustrates how can send a push notification (Tamada, 2012).

1- The Mobile device sends the sender id, and application id to The GCM server for registration.

2- When registration performed successfully, GCM server sends registration id to a mobile device.

3- When the mobile device receiving registration id, registration id will be sent by the mobile device to Apache server.

4- The Apache server will store registration id on the server of the database.

When need to send push notification message:

a- Apache server sends a message and registration id (that stored in database) to GCM server.

b- GCM server will send a message to a mobile device using device registration id, the mobile device will receive the message

Evaluation

After implementation of IQM system is finished, the Iraqi users tested The IQM system, that measures usability. Lewis questionnaire (1995) is adopted to test usability(Lewis, 1995). It contains of 19 questions and 7 degrees with scale (1- strongly agree – 7- strongly disagree). The questionnaires address evaluation at both a more detailed scenario level and at a global overall system level. According to (Sekaran & Bougie, 2010) "sample sizes larger than 30 and less than 500 are appropriate for most research". Thus, 30 respondents evaluated the questioners.

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CONCLUSION

At the final stage of our research, the study documented all the findings discovered from this research. Some findings discovered from the evaluation leaded to future research works, and the modification of the developed artifacts.

RESULT AND ANALYSIS

Requirements Gathering

After the researcher reviewed ebay, amazon e-marketplace mobile applications, and conducted the interview with two users, the functional requirements gathered and listed with priority, Table 2 shows the result of the functional requirements of the system. Note, the priority columns has three scales Mandatory (M), Desirable (D), and Optional (O).

Table 2 Functional requirement.

No.	Requirement Description	Priority
	Explore system	
1	The system shall allow guest users, registered users, and admin to explore dashboard of the system.	D
	Latest Ads	
2	The system shall allow guest, registered, and admin users to explore the latest ads of the system.	M
3	The system shall display the details of the ads.	M
	Add Ads	
4	The system shall allow registered, and admin users to add ads to the system.	M
5	The system shall allow registered users, and admin to add details of the ads according to category (car, house, home, travel, electronics, others)	D
6	The system shall check validation data.	D
	List Ads	
7	The system shall allow the registered user to display his/her ads.	D
	Ads Edit	
8	The system shall allow the registered user to edit his/her ads.	D
9	The system shall allow the admin to Edit all users' ads.	D
	Delete Ads	
10	The system shall allow the registered user to delete his/her ads.	D
11	The system shall allow the admin to Delete all users' ads.	D
	Search Ads	
12	The system shall allow the users to search for specific ads.	D
	Filter result	
13	The system shall allow the user to filter ads list according to his/her need.	D
	Follow Search	
14	The system shall provide service to follow the search.	M

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15	The system shall send a push notification when there are new ads posted in the system that match Follow Search service.	M
	Sign in	
16	The system shall allow users to sign in to the system.	M
	Edit Profile	
17	The system shall allow registered users to edit his/her profile information.	D
18	The system shall allow registered users to change his/her password	D
	Login	
19	The system shall allow registered users to Login.	M
20	The system shall show Loing button if the user has not already logged in.	M
	Control users	
21	The system shall allow the admin to control the users.	D
22	The system shall allow the admin to display the list of users' information.	D
23	The system shall allow the admin to display users' ads.	D
24	The system shall allow admin to delete the users and their ads from the system.	D

Design of The System

The design of the system includes Unified Modeling Language (UML) diagrams and a sketch of the system's architecture. In this paper, the Use case diagram and Sequence diagram was used. This diagram described the blueprint of the proposed system. The Visual Paradigm software has been used to draw a Use case diagram, and Sequence diagrams. The Use case diagram of the system has three actors and 14 of use cases, the actors are a guest user, a registered user, and an admin user. Figure 3 shows use case diagram of the IQM system.

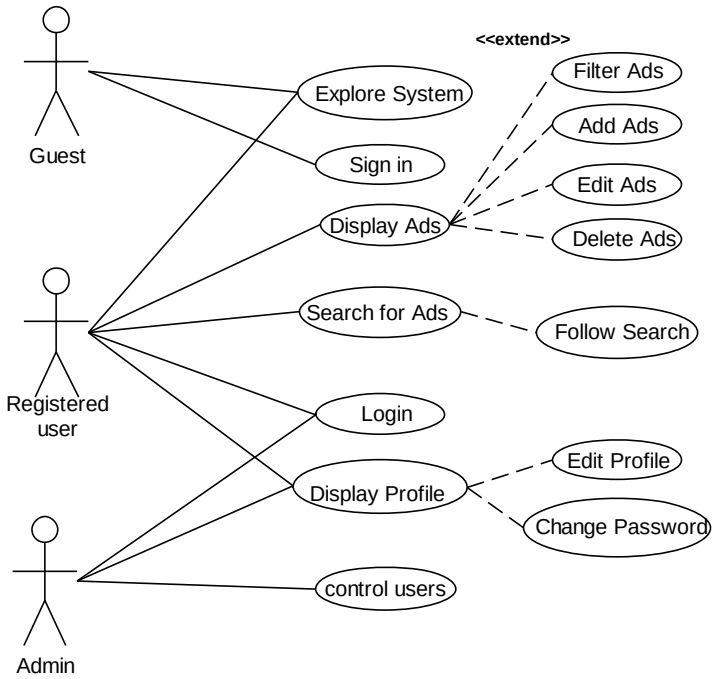

Figure 3 use case diagram for IQM system

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The Sequence diagram of the system has 4 main objects, the main objects are Interface, Controller, server, and GCM server, figure 4, and 5 show use Sequence diagram of the IQM system.

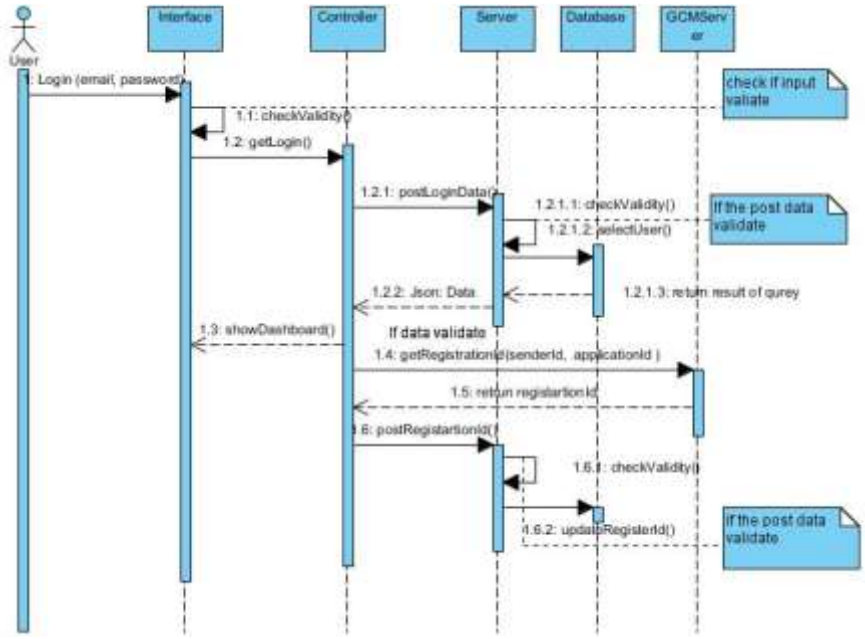

Figure 4 a sequence diagram for login and send a Registration ID of Gcm to the server

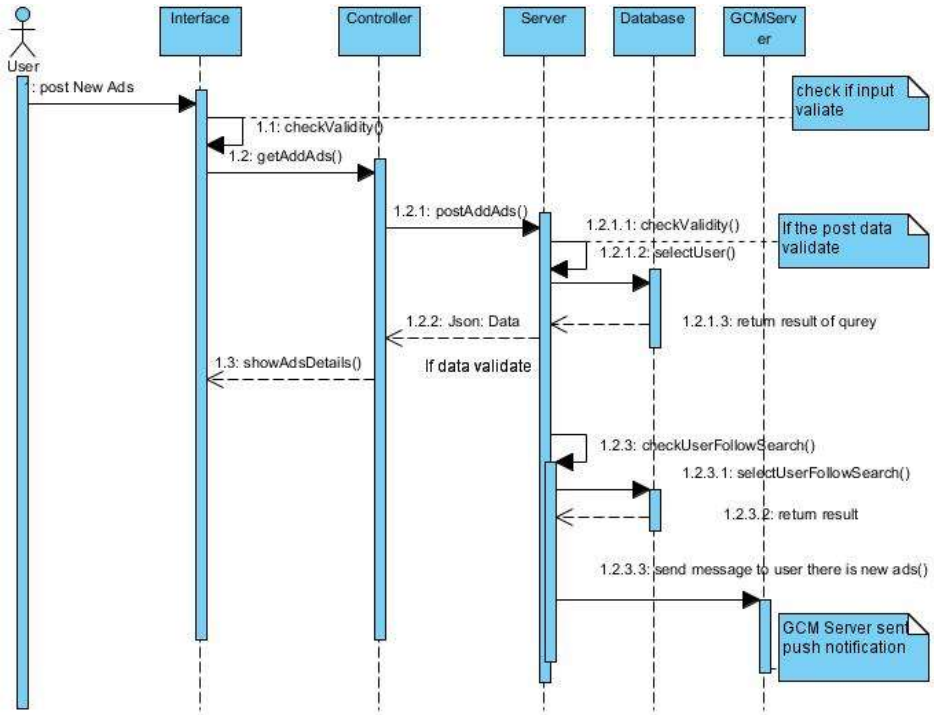

Figure 5 a sequence diagram for adding new ads and send push notification

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Entity relationship diagram (ERD) also has been used to design the database of the system, Dbforge software has been used to draw Physical ERD. Figure 6 shows the Physical ERD.

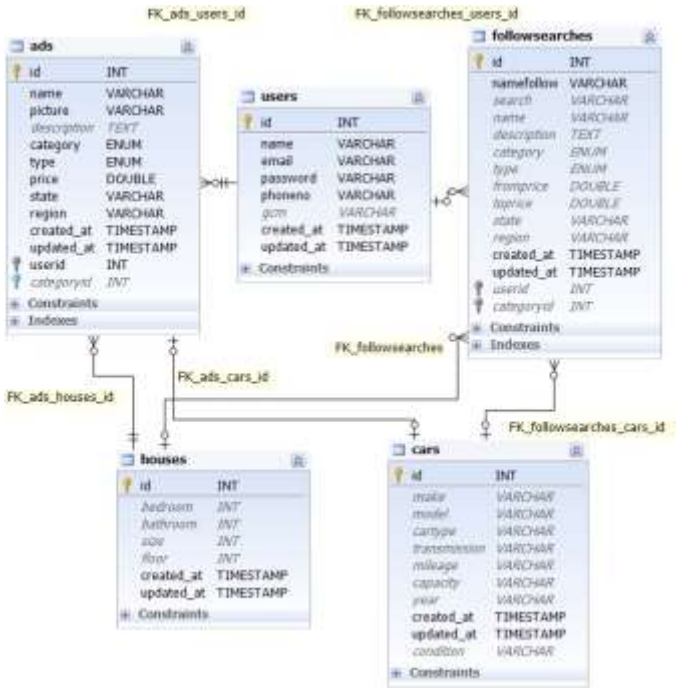

Figure 6 Physical ERD of the IQM system

Interfaces of application

The Interfaces of application design and implemented to meet the functional and non-functional requirement gathered in the first step. The interface of the system consist of various windows that enable different categories of users to interact with the system. This includes Dashboard panel, Ads panel, My Ads panel, Profile panel, and User control panel. Some of the main interfaces are illustrated in this section:

A. Dashboard panel

The dashboard panel of the system shows two tabs and list of buttons of the application. It also shows login button and Sign in button The Dashboard panel also shows the search text box and a search button. Search button navigates the user to ads panel. Figure 6 (a) shows Dashboard panel.

B. Ads Panel

The Ads panel shows list of information and image of the ads. Besides, it shows the search text box, filter button and follow search button. The Follow search button show message to follow search and to receive push notification whenever there is new ads, Figure 6 (b,c, d) illustrate that.

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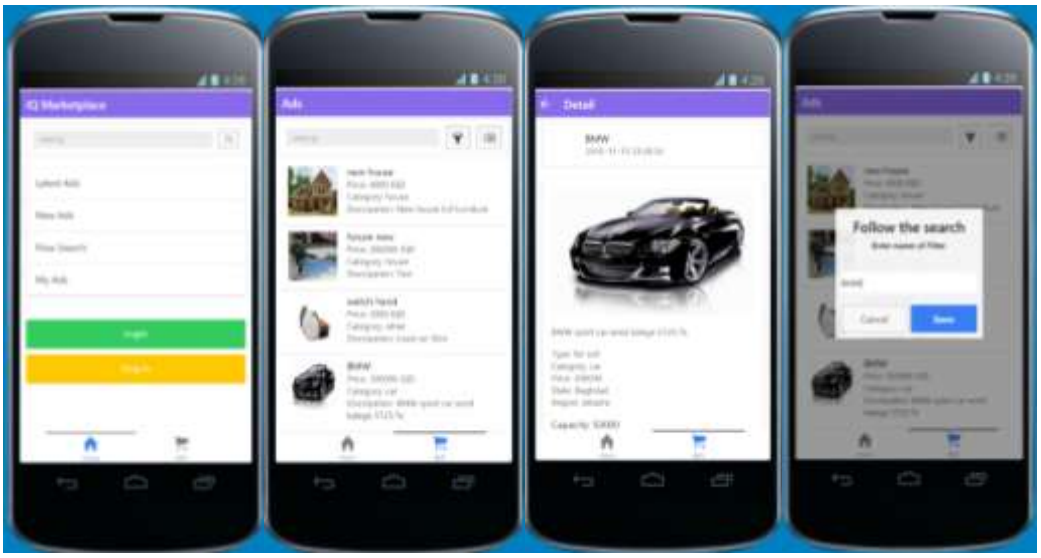
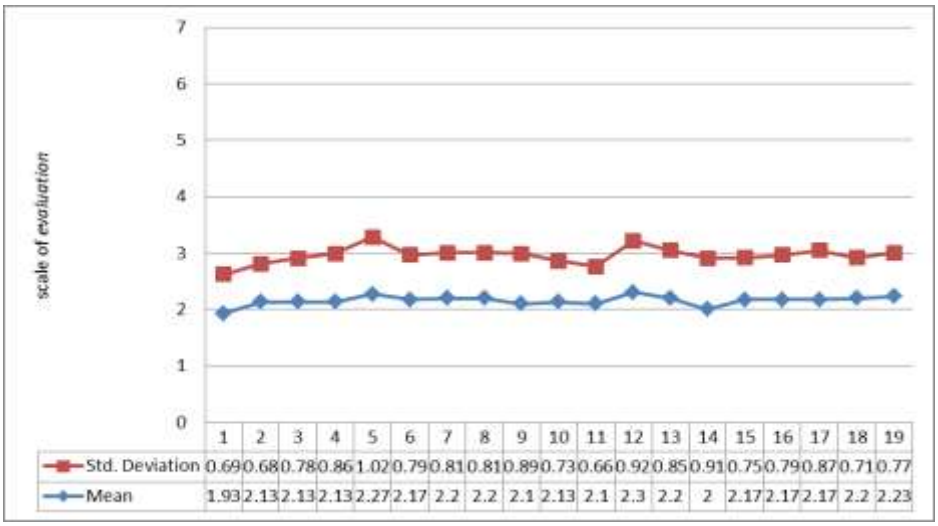


a b d e

Figure 6 shows the interface of the program, (a) shows the Dashboard panel of the system, (b) shows the list of ads, (d) shows the detail of the ads, and (e) shows the how to save follow search.

Evaluation Result

After the retrieval of the questionnaire, the result gathered is analyzed using Microsoft Excel and SPSS softwares. The result of the study confirmed that the prototype is satisfying by the users. According to the result of evaluation, there are no questions that have disagreed as the highest rate, and the vast majority of the rate is agree scale. The data analysis result shows a positive result in both system satisfaction and usability with how easy it uses the system. Std. Deviation and descriptive mean statistics for related questions to the system is shown in Figure 7.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Std. Deviation	0.69	0.68	0.78	0.86	1.02	0.79	0.81	0.81	0.89	0.73	0.66	0.92	0.85	0.91	0.75	0.79	0.87	0.71	0.77
Mean	1.93	2.13	2.13	2.13	2.27	2.17	2.2	2.2	2.1	2.13	2.1	2.3	2.2	2	2.17	2.17	2.17	2.2	2.23

Figure 7 Descriptive Std. Deviations and Mean Statistics

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CONCLUSION AND FUTURE WORK

The Iraq marketplace system is a mobile application which enables users to advertise goods and services, contact with the customers, and advertise at any place or anytime for the users. Iraq marketplace also helps buyers to search for ads and follow search. This is the first marketplace provide this Follow search service in Iraq that can be the guide and the key to the other markets to develop its own application. The researcher divided the development into five phases; the first phase is awareness of problem in the current marketplace and how to aggregate the requirements. The second phase, showed how to analyze and design the IQM system. The subsequent phases, focused on how to develop the system based on the requirements captured in the first phase; evaluated usability by using Computer System Usability Questionnaire which shows the system is satisfied in term of usability; and focused on documenting the whole finding. The future work will check how Follow Search service and push notification effect to the satisfaction of the user.

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